

CLAIMS

1. An optical element positioning arrangement, comprising a reflective optical element, actuators, flexures located between the actuators and said optical element, the arrangement being configured so that when a first actuator is actuated any displacement generated is transmitted via a flexure to said optical element and provided that a second actuator's displacement differs from the displacement of the first, the optical element is caused to swing, characterised in that the actuators are spaced relative to one another and placed substantially parallel to one another.
2. An optical element positioning arrangement, comprising an optical element, two or more actuators acting in the Z direction, two or more flexures located between two or more actuators and said optical element, the arrangement being configured so that when a first actuator is actuated any displacement generated is transmitted via a flexure to said optical element and provided that a second actuator's displacement differs from the displacement of the first, the optical element is caused to swing; characterised in that the actuators are spaced one relative to another and the flexures extending from the actuators are located inwards from the central axis of the actuators, whereby the achievable swing is greater than when the flexures are located along the central axis.
3. An optical element positioning arrangement, comprising an optical element, actuators acting in the Z direction, flexures located between the actuators and said optical element, the arrangement being configured so that when a first actuator is actuated any displacement generated is transmitted via a flexure to said optical element and provided that a second actuator's displacement differs from the displacement of the first, the optical element is caused to swing; characterised in that the arrangement employs two actuators only.
4. An optical element positioning arrangement, comprising an optical element, actuators acting in the Z direction, flexures located between the actuators and said optical element, the arrangement being configured so that when a first actuator is actuated any displacement generated is transmitted via a flexure to said optical element and provided that a second actuator's displacement differs from the displacement of the first, the optical

element is caused to swing; characterised in that the actuators are of rectangular cross-section.

5. An optical element positioning arrangement, comprising an optical element, actuators, flexures located between the actuators and said optical element, the arrangement being configured so that when a first actuator is actuated any displacement generated is transmitted via a flexure to said optical element and provided that a second actuator's displacement differs from the displacement of the first, the optical element is caused to swing, characterised in that the arrangement incorporates a display unit and the optical element projects a beam onto the display unit.

6. A laser marking system, comprising an optical element for directing the light beam used for marking a substrate; and an actuator for displacing the optical element; characterised in that the system comprises a connection between the actuator and said optical element to transmit movement from the actuator to the optical element and a flexure for supporting the optical element so that when an actuator is actuated the optical element is caused to swing.

7. A laser marking system according to Claim 6, wherein the optical element directs light onto a divergent lens located between the substrate to be marked and the optical element.

8. A laser marking system according to Claim 6, wherein the optical element directs light onto a convergent lens located between the substrate to be marked and the optical element.

9. A laser marking system according to any of Claims 6 to 8, comprising a post-spot camera for monitoring the marking and means for comparing the values obtained by the camera with pre-determined levels and adjusting the marking parameters if necessary.

10. A laser marking system according to any of Claims 6 to 8, comprising a photo-detector set to monitor the marking.

11. A laser marking system according to any of Claims 6 to 10, comprising means for measuring the marking distance and adjusting the marking parameters of the system in accordance with the distance.
12. A laser marking system according to any of Claims 6 to 11, comprising means for measuring the relative values of combustion light and beam power.
13. A laser marking system according to any of Claims 6 to 12, comprising an arrangement of any of Claims 1 to 6.
14. A laser marking system according to any of Claims 6 to 13, wherein the actuator incorporates no galvanometer.
15. A laser marking system according to any of Claims 6 to 14, wherein the actuator is a monolithic 2D actuator.
16. A laser marking system according to Claim 15, wherein the actuator is connected to the optical element via a flexure.
17. A laser marking system according to any of Claims 6 to 14, comprising a first optical element positioning arrangement using piezoelectric actuation to displace a first optical element in a first one dimensional direction and a second optical element positioning arrangement using piezoelectric actuation to displace a second optical element in a second one dimensional direction, the first and the second arrangement being arranged in series.
18. A laser marking system according to any of Claims 6 to 14, comprising an optical element positioning arrangement using piezoelectric actuators for displacing the element in two dimensions.
19. A laser marking system, according to any of Claims 6 to 14, wherein the actuator is a thermo-electric actuator.

20. A laser marking system, according to any of Claims 6 to 19, comprising means for changing scanning speed in order to provide gaps in between characters.

21. A laser marking system, according to any of Claims 6 to 20, comprising a fibre laser incorporating a fibre for transmitting light onto an optical element for directing the light onto a reflector equipped with means for positioning said reflector in order to direct light onto a substrate to be marked.